REMARKS

Now in the application are Claims 1-36, of which Claims 1, 8, 11, 15, 19, 26, 29, and 33 are independent. This Amendment adds new Claims 19-36. The amendment presents no new matter. The following comments address all stated grounds for rejection, and place the presently pending claims, as identified above, in condition for allowance.

Claim Rejections under 35 U.S.C. Section 103

IA. Rejection of Claims 1, 11-13, 15, and 16 under 35 U.S.C. Section 103(a):

The Office Action rejects Claims 1, 11-13, 15, and 16 as being unpatentable over U.S. Patent No. 5,026,153 of Suzuki, *et al* (hereinafter "Suzuki") in view of U.S. Patent No. 5,223,907 of Asayama U.S. Patent No. 6,041,274 (hereinafter "Asayama"). Applicants respectfully traverse this rejection on the basis of the following arguments, and further contend that neither Suzuki, nor Asayama, alone or in combination, teach or suggest each and every element of these claims, as described below, and hence, does not detract from the patentability of the claimed invention.

Summary of the Claimed Invention

Applicants' invention is directed to object recognition systems and object recognition methods for recognizing an object in front of a vehicle. Each system and method is capable of recognizing objects using a plurality of windows in images captured using one or more sensors mounted on a vehicle. The object recognition systems and object recognition methods of Applicants' invention address the recognition errors caused by measurement errors introduced due to a vehicles pitch or roll when a vehicle travels up a grade or down a grade, or when the attachment point or the installation angle of the camera changes from an initially installed position.

Summary of the Suzuki Patent

The Suzuki patent is concerned with a vehicle tracking control system for continuously detecting a distance and a direction to a preceding vehicle. The tracking

control system disclosed by the Suzuki patent requires the preceding vehicle to have a light source installed on a center of the rear side portion (i.e., in a region between the tail lights) and a light source circuit for emitting light projected from the light source. Accordingly, a properly equipped vehicle immediately to the rear having a light receiving optical system according to the teachings of the Suzuki patent is able to detect the emitted light from the rear mounted light source then determine the distance to the preceding vehicle. Contrary to the Examiner's assertions, the Suzuki patent does not teach, amongst other features, a means for comparing and an inclination estimation means. The Examiner recognizes that the Suzuki patent does not teach a measuring means and a means for storing.

Summary of the Asayama Patent

The Asayama patent is concerned with a guardrail detecting system. The guardrail detecting system is mounted on a motor vehicle and has two image sensors spaced vertically to sense a scene in front of the motor vehicle. The system includes a window setting device for setting a number of windows on a display screen at predetermined positions and a distance calculating device for calculating the distances from the vehicle to the guardrail held as images in the windows. The Examiner cites the Asayama patent for teaching the dividing of a captured image into a plurality of windows, then measuring a distance to the road surface for each of the windows and storing for each of the windows an estimated distance to the road surface. Nevertheless, the Asayama patent fails to teach or suggest, amongst other features, the use of an estimated distance to the road surface.

The Claimed Invention Distinguishes Patentability Over The Cited References

Claims 1, 11-13, 15, and 16 are not rendered obvious by the cited Suzuki patent nor the cited Asayama patent, alone or in combination. Claims 1, 11, and 15, recite an object recognition system, an object recognition method, and an object recognition system, respectively, that compare measured distances for each window of a captured image with an estimated distance to the road surface for each window to determine if the

measured distances corresponds to the road surface. Each claimed object recognition system and object recognition method further estimate inclination of the vehicle based on the measured distances that are determined to correspond to the road surface. Accordingly, based on such estimated inclination, the estimated distances are modified.

Claims 12 and 13 depend, directly or indirectly, from Claim 11 and thereby incorporate the novel features of Claim 11. Claim 16 depends from Claim 15 and therefore incorporates the novel features of Claim 16. Accordingly, the arguments asserted below with respect to independent Claims 1, 11, and 15 are equally applicable to each corresponding dependent claim.

Neither the Suzuki patent nor the Asayama patent, alone or in combination, teach or suggest any structure, function or operation for comparing, for each of a plurality of windows, a measured distance with an estimated distance to determine if the measured distance belongs to a road surface. In the Office Action the light source mounted at a predetermined position of the rear side of the preceding vehicle, as taught by the Suzuki patent is cited as corresponding to an estimated distance. Further, the measured distance "L" taught by the Suzuki patent is cited in the Office Action as the measured distance. Still further, the position comparing means taught in the Suzuki patent is cited in the Office Action as comparing the position of the light source (1) (estimated distance) with the vehicle distance "L" (measured distance) to determine if the measured distance belongs to the road surface. Applicants assert this interpretation is not correct.

The positioning of the light source is critical to the operation of the operation of the tracking control system taught by Suzuki particularly when the system is configured with a left and a right light receiving system. The positioning of the light source does not provide an estimated distance to the road surface as measured from the light source in a downward direction to the road. Rather, the positioning of the light source is fundamental to the determination of the actual vehicle distance "L" because if the light source is offset from the center rear portion of the preceding vehicle the triangulation technique used to determine "L" is inaccurate. That is, the Suzuki patent performs triangulation to determine a distance "L" to the immediate preceding vehicle and the distance from the road surface to the light source is irrelevant to the determination of "L".

Furthermore, "L" is the distance to the light source of the preceding vehicle and is not distance to the road surface.

Moreover, the cited comparing means compares image formation position X_R, which corresponds to the right optical path of the system taught by Suzuki, and image formation position X_L, which corresponds to the left optical path of the system taught by Suzuki, to produce ΔX. The comparing means taught by Suzuki does not compare, for each of a plurality of windows, a measured distance with an estimated distance to determine if the measured distance belongs to the road surface.

The Asayama patent teaches the comparison between two actual images to determine the distance between the guardrail and the vehicle. The Asayama patent is cited for teaching a measuring means for dividing an image into a plurality of windows and measuring a distance to the road surface for each window. The Asayama patent is also cited for teaching a means for storing, for each of the plurality of windows, estimated distance to the road surface. Nevertheless, the Asayama reference fails to teach or suggest a means or an act for comparing, for each of the plurality of windows, the measured distance with the estimated distance to determine if the measured distance belongs to the road surface. Hence, neither the Suzuki patent nor the Asayama patent, alone or in combination, establish a *prima facie* case of obviousness, and thus fail to detract from the patentability of Claims 1, 11-13, 15, and 16.

In contrast to the cited references, Claim 1 recites an object recognition system mounted on a vehicle having, amongst other features, means for comparing, for each of the plurality of the windows, the measured distance with the estimated distance to determine if the measured distance belongs to the road surface. Likewise, Claims 15 and 16 recite object recognition systems mounted on a vehicle for recognizing an object in front of a vehicle by comparing a measured distance with an estimated distance to determine if the measured distance belong to the road surface. Furthermore, Claims 11, 12 and 13 recite an object recognition method for recognizing an object in front of a vehicle by, in addition to other steps, comparing for each window of an image, a measured distance with an estimated distance to determine if the measured distance belongs to the road. Neither the Suzuki patent nor the Asayama patent, alone or in combination, teach or suggest comparing, for each of a

plurality of windows, a measured distance with an estimated distance to determine if the measured distance belongs to the road surface.

Consequently, the system of Claim 1; the method of Claim 11; and the system of Claim 15 are not rendered obvious by the Suzuki patent in view of Asayama patent. Accordingly, Applicants' request the Examiner to reconsider and withdraw the rejection of Claims 1, 11-13, 15, and 16 under 35 U.S.C. §103.

IB. Rejection of Claims 2-10, 14, 17 and 18 under 35 U.S.C. Section 103(a):

The Office Action rejects Claims 2-10, 14, 17 and 18 as being unpatentable over the Suzuki patent in view of the Asayama patent and in further view of U.S. Patent No. 5,638,116 of Shimoura, *et al.* (hereinafter "Shimoura"). Applicants respectfully traverse this rejection on the basis of the following arguments, and further contend that the combination of Suzuki in view of Asayama and in further view of Shimoura fail to teach or suggest all elements of these claims, as described below, and hence, does not obviate the claimed invention.

Summary of the Shimoura Reference

The Shimoura reference is directed to an object recognition apparatus that relies upon a single point in an image, that is, the vanishing point, to determine the pitch, roll, and yaw of a vehicle on a roadway. The vanishing point is defined as the point at which the road vanishes in a captured image. *See*, Column 16, lines 3 and 4, of Shimoura.

The Claimed Invention Distinguishes Patentability Over The Cited References

Claims 2- 7 depend, directly or indirectly from Claim 1 and thereby incorporate the novel features of Claim 1. Claim 8 recites a means for comparing that compares a measured distance with an estimated distance for each window in a captured image of an object. Claims 9 and 10 depend from Claim 8 and therefore incorporate the novel features of Claim 8. Claim 14 depends, directly or indirectly, on Claim 11 and hence, therefore incorporates the novel features of Claim 11. Claims17 and 18 depend, directly or indirectly, on Claim 15 and thereby incorporate the novel features of Claim 15.

As discussed above neither the Suzuki patent nor the Asayama patent, alone or in combination, teach of suggest each and every element of independent Claims 1, 11, and 15. The Shimoura reference fails to bridge the factual deficiencies of the Suzuki patent and the Asayama patent. Shimoura relies upon a single point in an image, that is, the vanishing point, to determine the pitch, roll, and yaw of a vehicle on a roadway. Neither the Suzuki patent nor the Asayama patent nor the Shimoura patent teach or suggest a system or method for recognizing an object in front of a vehicle that compares measured distances for each window in a captured image of a road surface with an estimated distance to the road surface for each window to determine if the measured distances corresponds to the road surface.

Accordingly, neither the Suzuki patent, nor the Asayama patent, nor the Shimoura patent, alone or in any combination, establish a *prima facie* case of obviousness and thus, fail to detract from the patentability of Claims 2-10, 14, 17, and 18. Neither the Suzuki patent, nor the Asayama patent nor the Shimoura patent, alone or in any combination, teach or suggest each and every element of Claims 2-10, 14, 17 and 18. Hence, Applicants' respectfully request the Examiner to reconsider and withdraw the rejection of Claims 2-10, 14, 17 and 18 under 35 U.S.C. §103.

New Claims 19-36

New Claims 19-36 are not anticipated by nor are they rendered obvious by the cited references either alone or in combination. Specifically, each cited reference fails to disclose, teach or suggest either a means for storing or an act of storing for each of a plurality of windows, estimated distance to a road surface, the initial values of the estimated distance having been calculated under a condition that the vehicle is positioned parallel to the road surface. Accordingly, new Claims 19-36 are patentably distinct from each of the cited references either alone or in any combination.

CONCLUSION

For the foregoing reasons, Applicants contend that Claims 1-36 define over the cited art. If there are any remaining issues, an opportunity for an interview is requested prior to the issuance of another Office Action. If the above arguments are not deemed to place this case in condition for allowance, the Examiner is urged to call Applicants' representative at the telephone number listed below.

Respectfully submitted,

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